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Attrition of Public School Mathematics and Science Teachers

Staffing the nation's schools with well-qualified teachers has long been a prominent issue in elementary and secondary education (Wayne and Youngs 2003). Mathematics and science teachers are of particular interest because mathematics and science are core subjects in both elementary and secondary public schools. These subjects continue to attract attention as the need for individuals entering the workforce with advanced knowledge in these areas remains high (National Science Board 2006). Maintaining a sufficient supply of mathematics and science teachers depends on both entry rates into these teaching fields and attrition from these fields. This Issue Brief reports on trends in the attrition of public school mathematics and science teachers over a 16-year period and examines the reasons given by mathematics and science teachers for leaving teaching employment. Previous research has shown that the distribution of teachers who left teaching employment varies by teacher characteristics (e.g., age) (Marvel et al. 2007). Therefore, findings are shown by this and other teacher characteristics.

The Schools and Staffing Survey (SASS), administered by the National Center for Education Statistics (NCES), collects information on public and private elementary and secondary schools, as well as the teachers and administrators who staff them. A key component of SASS is the Teacher Follow-up Survey (TFS), which is a follow-up of a representative sample of the public and private elementary and secondary school teachers who participated in the previous year's SASS. According to Marvel et al. (2007), 84 percent of public school teachers were still teaching at the same school in the 2004–05 school year as in the 2003–04 school year, but the remaining 16 percent had either moved to a different school (8 percent) or left teaching employment altogether (8 percent). The current analysis focuses on the latter group—public school teachers who left teaching employment between the 2003–04 and 2004–05 school years.[1,2] Moreover, since the TFS has been conducted periodically since 1988–89, the analysis is also able to examine trends in teacher attrition between the 1988–89 and 2004–05 school years.

In this Issue Brief, public school teachers who reported a main teaching assignment of mathematics or science are referred to as "mathematics and science teachers."[3] Those public school teachers who reported a main teaching assignment in a field other than mathematics or science are referred to as "other teachers."[4] Teachers who had left teaching employment between the time of the base-year survey (i.e., SASS) and the follow-up survey (i.e., TFS) are referred to as "leavers."

Trends in Mathematics and Science Leavers

Overall, the rate of public school mathematics and science teachers and other teachers leaving teaching employment showed no consistent trend from 1988–89 through 2004–05 (table 1). Of mathematics and science leavers, there was no measurable change in the percentage of mathematics and science teachers leaving teaching employment between 1988–89 and 2004–05. For example, of the mathematics and science teachers who were teaching during the 1987–88 school year, 5 percent had left the teaching profession by the following school year. Of those who were teaching in the 2003–04 school year, 6 percent had left by the following school year. In contrast, the leaving rate for other public school teachers increased 3 percentage points between 1988–89 and 2004–05 (6 vs. 9 percent, respectively). Furthermore, the percentage of other teachers leaving teaching employment increased from 7 percent in 2000–01 to 9 percent in 2004–05.

Characteristics of Mathematics and Science Leavers

Between the 2003–04 and 2004–05 school years, a greater percentage of mathematics and science teachers who had always taught part-time[5] left teaching employment than did those with 1 to 5 years and 6 years or more of full-time teaching experience (81 vs. 7 and 6 percent, respectively) (table 2). Differences were also found by age and base salary. For example, a greater percentage of mathematics and science teachers 50 years or older left the teaching profession than did those 35 to 49 years old and those less than 35 years old (11 vs. 3 and 6 percent, respectively). In addition, a greater percentage of mathematics and science teachers with a base salary of less than $30,000 left teaching employment than those earning $30,000 to $39,999 (11 vs. 5 percent).[6,7,8]

Differences were also found between mathematics and science leavers and other leavers. Overall, a smaller percentage of mathematics and science teachers than other teachers left teaching employment between the 2003–04 and 2004–05 school years (6 vs. 9 percent).[9] Among those teachers with no full-time teaching experience, a greater percentage of mathematics and science teachers than other teachers left teaching employment (81 vs. 15 percent). In contrast, of leavers with 6 years or more of full-time teaching experience, a smaller percentage of mathematics and science teachers than other teachers left teaching employment (6 vs. 8 percent).

Differences between mathematics and science leavers and other leavers were also found by teachers' base salary, sex, and certification type. Of leavers earning $30,000 or more, a smaller percentage of mathematics and science teachers than other teachers left the profession. A smaller percentage of female mathematics and science teachers than other female teachers left teaching employment (6 vs. 9 percent). Of those teachers with

a regular state certification, mathematics and science teachers were also less likely than other teachers to leave teaching employment (6 vs. 9 percent).

Reasons for Leaving Teaching

Teachers who left teaching employment were asked to rate selected reasons (listed in table 3)—on a scale from "not important" to "extremely important"—behind their decision to leave teaching employment between the 2003–04 and 2004–05 school years.[10] In the year following their departure from teaching, greater percentages of mathematics and science leavers rated retirement (34 percent) than five other reasons listed in table 3 as very important or extremely important in their decision to leave. These five other reasons were dissatisfaction with previous school or teaching assignment (21 percent), dissatisfaction with teaching as a career (18 percent), a school staffing action (14 percent), taking courses to improve career opportunities within the field of education (9 percent), and taking courses to improve career opportunities outside the field of education (9 percent). Furthermore, higher percentages of mathematics and science teachers reported better salary and benefits (25 percent) and the pursuit of a position other than K–12 educator (23 percent) as very important or extremely important in their decision to leave, compared to a school staffing action (14 percent), taking courses to improve career opportunities within the field of education (9 percent), or taking courses to improve career opportunites outside the field of education (9 percent).

With one exception, no measurable differences were found between mathematics and science leavers and other leavers in the percentages rating the selected reasons for leaving as very important or extremely important. The one exception was that a greater percentage of mathematics and science leavers than other leavers rated better salary or benefits as very important or extremely important (25 vs. 13 percent).

Summary

The percentage of public school mathematics and science teachers who left teaching employment did not change measurably between 1988–89 and 2004–05. However, the percentage of other public school teachers who left teaching employment did increase over the same period. Differences were found among mathematics and science

Table 1. Trends in the percentage of public school mathematics and science leavers and all other leavers: Selected years, 1988–89 through 2004–05

Teaching assignment	1988–89	1991–92	1994–95	2000–01	2004–05
Mathematics and science teachers	5.1	4.5	6.2	8.2	6.4
Other teachers	5.6	5.2	6.6	7.3	8.7

NOTE: Teachers who reported a main teaching assignment of mathematics or science are referred to as "mathematics and science teachers." Those teachers who reported a main teaching assignment in a field other than mathematics or science are referred to as "other" teachers. Teachers who had left the profession between the time of the base-year survey (i.e., Schools and Staffing Survey) and the follow-up survey (i.e., Teacher Follow-up Survey) are referred to as "leavers." Standard errors can be found at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2008077.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Teacher Follow-up Survey (TFS), "Current and Former Data Files," 2004–05.

Table 2. Percentage distribution of public school teachers and the percentage of public school leavers between school years 2003–04 and 2004–05, by main assignment field and selected teacher characteristics: 2004–05

	All teachers			Leavers		
Teacher characteristic in base year[1]	Total	Mathematics and science teachers	Other teachers	Total	Mathematics and science teachers	Other teachers
Total	**100.0**	**100.0**	**100.0**	**8.4**	**6.4**	**8.7**
Full-time teaching experience[2]						
No full-time teaching experience	0.9	0.4!	1.0	19.6!	80.5	15.3!
1–5 years	28.3	31.3	27.8	9.2	6.5	9.7
6 years or more	70.8	68.3	71.2	7.9	5.9	8.2
Age						
Less than 35 years	32.0	33.1	31.9	8.7	6.2	9.1
35–49 years	36.6	39.5	36.1	5.2	3.3	5.5
50 years or older	31.4	27.4	32.0	11.8	11.0	11.9
Base salary						
Less than $30,000	12.1	12.8	12.0	10.6	11.2	10.5
$30,000–$39,999	34.8	37.2	34.4	7.2	4.9	7.6
$40,000 or more	53.1	50.0	53.6	8.7	6.3	9.0
Sex						
Male	24.4	39.2	22.0	7.7	6.7	8.0
Female	75.6	60.8	78.0	8.6	6.2	8.9
Teaching status						
Full-time	91.0	95.3	90.3	7.5	6.2	7.8
Part-time	9.0	4.7	9.7	16.9	10.8!	17.4
Certification type[3]						
Regular state certification	87.6	89.1	91.5	8.2	5.9	8.6
Other certification	7.3	9.2	7.0	8.5	9.0	8.4
None of the above	1.5	1.7!	1.5	17.7	20.8!	17.2!
School level taught						
Elementary	64.4	39.6	68.4	8.5	6.1	8.7
Secondary	30.4	53.3	26.7	8.6	7.0	9.1
Combined	5.2	7.1	4.9	6.3	3.4!	7.0

! Interpret data with caution. Standard error is more than one-third as large as the estimate.

[1]Base year refers to 2003–04.

[2]Teachers with no full-time teaching experience are those teachers who have always worked part-time. They reported being less than full-time and reported having no prior full-time teaching experience in either a private or public school. Of math and science teachers this represents less than 0.5 percent and for all other teachers it represents approximately 1.0 percent. The actual estimated count for all teachers is 28,100 as reported in table 3 of Marvel et al. (2007). It should be noted that those teachers who were in their first year of full-time teaching in 2003–04 are included in the "1 to 5 years" category.

[3]"Regular state certification" includes regular or standard state certificates, advanced professional certificates, and probationary certificates (issued after satisfying all requirements except the completion of a probationary period). "Other certification" includes provisional or temporary certificate and waiver or emergency certificate.

NOTE: Teachers who reported a main teaching assignment of mathematics or science are referred to as "mathematics and science teachers." Those teachers who reported a main teaching assignment in a field other than mathematics or science are referred to as "other" teachers. Teachers who had left the profession between the time of the base-year survey (i.e., Schools and Staffing Survey) and the follow-up survey (i.e., Teacher Follow-up Survey) are referred to as "leavers." Detail may not sum to totals because of rounding. Standard errors can be found at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2008077.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Teacher Follow-up Survey (TFS), "Current and Former Data Files," 2004–05.

leavers by various teacher characteristics. For example, between the 2003–04 and 2004–05 school years, a greater percentage of mathematics and science teachers with no full-time teaching experience left teaching employment than those with 1 to 5 years and 6 years or more of full-time teaching experience. Differences were also found between mathematics and science leavers and other leavers. For example, of those teachers with a regular or standard certification, a smaller percentage of mathematics and science teachers than other teachers left teaching employment. Finally, when asked to rate various reasons for leaving the teaching profession, greater percentages of mathematics and science leavers than other leavers rated better salary or benefits as very important or extremely important.

Table 3. Percentage of public school teachers who rated various selected reasons as very important or extremely important in their decision to leave K–12 teaching, by main assignment field: 2004–05

Reason for leaving	Main teaching assignment		
	All teachers	Mathematics and science teachers	Other teachers
Retirement	31.4	34.1	31.0
School staffing action[1]	14.6	14.2	14.7
Better salary or benefits	14.2	25.3	12.8
To pursue a position other than that of a K–12 teacher	25.3	23.4	25.5
To take courses to improve career opportunities within the field of education	8.9	9.3	8.8
To take courses to improve career opportunities outside the field of education	5.3	8.8	4.8
Dissatisfied with teaching as a career	14.6	18.4	14.1
Dissatisfied with previous school or teaching assignment	16.0	20.8	15.4

[1]For example, reduction-in-force, lay-off, school closing, school reorganization, or reassignment.

NOTE: Respondents were also asked to rate the importance of other reasons in their decision to leave teaching employment that are not listed here. These selected reasons were changed residence, health, pregnancy or child rearing, and other family or personal reasons. Standard errors can be found at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2008077.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Teacher Follow-up Survey (TFS), "Current and Former Data Files," 2004–05.

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Endnotes

[1]See Marvel et al. (2007) for data on teachers who moved to a different school between 2003–04 and 2004–05.

[2]The small sample size for the private school teachers precludes in-depth analysis of this category of teachers.

[3]"Science" refers only to the natural sciences, which include biology/life sciences, chemistry, Earth sciences, engineering, physics, and other natural sciences.

[4]Main teaching assignments other than mathematics and science include early childhood/general elementary, special education, arts/music, English/language arts, social sciences, and all others, including computer science, English as a second language, foreign languages, health education, vocational/technical education, and other miscellaneous subjects.

[5]Teachers with no full-time teaching experience are those teachers who are less than full-time and reported having no prior full-time teaching experience in either a private or public school. Of mathematics and science teachers this represents less than 0.5 percent and for all other teachers it represents approximately 1.0 percent. The actual estimated count for all teachers is 28,100 as reported in table 3 of Marvel et al. (2007). It should be noted that those teachers who were in their first year of full-time teaching in 2003–04 are included in the "1 to 5 years" category.

[6]It is important to note that many of the teacher characteristics used for independent analysis may also be related to each other. However, this Issue Brief focuses on the bivariate relationships, rather than more complex analyses, to provide descriptive information on the characteristics of mathematics and science leavers in public schools.

[7]Because all of the teachers in the 2004–05 TFS sample had been respondents to the 2003–04 SASS, some questions (e.g., on age, sex) were not repeated in the TFS questionnaire. For this reason, some of the data on teacher characteristics presented in this Issue Brief are drawn from the 2003–04 SASS. These SASS data are termed "base-year" data because the SASS responding teachers form the base for the teachers who are selected.

[8]Among mathematics and science teachers who left teaching employment, no measurable difference was found between those with a base salary of less than $30,000 and those earning $40,000 or more.

[9]No measurable differences were found between mathematics and science leavers and other leavers for the previous years.

[10]Respondents were also asked to rate the importance of other reasons in their decision to leave teaching employment that are not listed in table 3. These selected reasons were changed residence, health, pregnancy or child rearing, and other family or personal reasons. The estimates for all public school teachers for these four reasons can be found in table 6 in Marvel et al. (2007).

The Issue Brief series presents information on education topics of current interest. All estimates shown are based on samples and are subject to sampling variability. All differences discussed are statistically significant at the .05 level as measured by two-tailed *t* tests; this means a difference is discussed only if the probability that it is due to chance (i.e., sampling variability) is less than 1 in 20. In addition to *t* tests, linear regression was used to test trends over time. No adjustments were made for multiple comparisons. In the design, conduct, and data processing of National Center for Education Statistics (NCES) surveys, efforts are made to minimize the effects of nonsampling errors, such as item nonresponse, measurement error, data processing error, or other systematic error. For more information on the Schools and Staffing Survey (SASS), visit http://nces.ed.gov/surveys/sass.

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